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and the Augmented Heckscher-Ohlin Model

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Incidence Theory, Specific Factors and the Augmented Heckscher-Ohlin Model*

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The concepts of 'true protection' and the 'incidence of protection' are potentially very useful for the evaluation of commercial policy. These concepts have been developed in the context of a model in which the production functions are implicit. The present paper develops the analysis of true protection in models in which the factors of production are explicitly identified. The paper finds that the Heckscher-Ohlin model may not be an appropriate vehicle for the analysis of the effects of tariffs, while the specific-factors model facilitates a fuller evaluation of, and permits additional insights into, the incidence of protection.

1 Introduction

The concepts of the 'incidence of protection' and the 'true rate of protection' were introduced by Sjaastad (1980a), Sjaastad and Clements (1981) and Clements and Sjaastad (1984), building upon earlier work by Dornbusch (1974). Rather than focusing on the price of importables relative to exportables, they introduce a non-tradables sector to analyze the degree to which protection favours the export sector and the import competing sector relative to non-tradables. The 'true' rate of protection of importables, for example, is the degree to which a protective structure (which includes taxes and subsidies on both imports and exports) raises the domestic price of importables relative to non-tradables. Recently Greenaway and Milner (1988) have extended the

analysis to the case of intra-industry trade.[1]

The Sjaastad-Clements analysis is carried out in a model with an implicit production function; that is, the analysis makes use of elasticities of supply, but the factors of production are not identified. The present paper develops the concept of true protection by spelling out the production side of the model in more detail. One of the advantages of this elaboration of the model is that it shows how tariff protection affects the returns to the factors of production.

The notion of tariff protection of a sector carries two connotations to international trade economists. One is that resources are likely to flow into a sector that receives a high rate of protection rel-

[1] The original Sjaastad-Clements work has given rise to a growing empirical literature. Early contributions are summarized in Clements and Sjaastad (1984). In the main these focus on analyzing incidence in Latin American countries. More recently Greenaway and Milner (1987) and Greenaway (1989) evaluate incidence in Mauritius and Côte d'Ivoire respectively. For the most part empirical work has concentrated on developing countries. Two applications in industrialized countries are Choi and Cumming (1988) for Australia, and Smeets (1990) for West Germany.

ative to other sectors; the other is that the factors in a highly protected sector are likely to benefit from the tariff structure. In order to investigate whether tariff protection does have these consequences, it is necessary to specify which factors are employed in which sectors.

With regard to the production structure, we shall employ three different models. One is the standard Heckscher-Ohlin (or capital-labour) model, augmented by a non-tradables sector. This is the augmented Heckscher-Ohlin model referred to in the title of the paper. Given the prominence of the Heckscher-Ohlin model in the literature, this augmented model is one that is likely to occur to many economists as they approach the problem. A second model is one which contains labour and land in addition to capital, but capital is internationally mobile, so that its price is exogenous to a small country. A third model is the specific-factors model, in which labour is used in all sectors while each sector also employs a factor specific to that sector.[2] In all of our models there are just three productive sectors: exports, import-competing production, and non-tradables.

To anticipate our results, the first two models, the augmented Heckscher-Ohlin and the internationally mobile capital models, have the property that the number of traded goods (two) is equal to the number of domestically determined factor prices. That is, they are 'even' models in the language of Ethier (1984). In such models the factor prices are determined by the commodity prices, and consequently the supply curve of one of the sectors is horizontal. This property causes the Sjaastad-Clements analysis, which is based on general equilibrium supply elasticities, to break down. However the effects of tariffs on factor prices are perfectly determinate and can be readily calculated, as is shown below. What is more significant is that these even models produce some surprising and apparently perverse effects of tariffs, which suggests that these models are not appropriate vehicles for the analysis of the effects of protection, despite their initial appeal. The specific-factors model, on the other hand, provides a natural extension of the Sjaastad-Clements

framework. It facilitates a fuller evaluation of, and permits additional insights into, the incidence of protection.

The remainder of the paper is organized as follows. As a starting point Section II presents incidence theory with an implicit production function in the manner of Sjaastad-Clements; Section III examines incidence theory in the two even models, while Section IV extends the analysis into a specific-factors setting. Finally, Section V contains some concluding observations.

II Incidence Theory: The Sjaastad-Clements Analysis

We shall consider a small open economy model with three sectors. Sector 1 is exportables, sector 2 is import-competing production, and sector 3 is non-tradables. The supply of and demand for non-tradables may be written in differential form as follows:

$$\hat{q}_3^s = \varepsilon_{31}\hat{p} + \varepsilon_{32}\hat{p}_2 + \varepsilon_{33}\hat{p}_3 \qquad (1)$$

$$\hat{q}_3^d = n_{31}\hat{p} + n_{32}\hat{p}_2 + n_{33}\hat{p}_3 \qquad (2)$$

where the ε's and the n's are the compensated supply and demand elasticities for non-tradables, and, like Sjaastad and Clements, we assume that policy intervention has no income effects.[3] Thus ε_{32} is the elasticity of supply of non-tradables with respect to p_2 (the price of importables), holding all other prices constant. A hat ($^\wedge$) denotes a proportional change in prices or quantities.

The homogeneity constraint implies that ε's and n's each sum to zero. This constraint, together with the equality of supply and demand implies

$$\hat{p}_3 = \omega\hat{p}_2 + (1 - \omega)\,\hat{p}_1$$

where:

$$\omega = \frac{(n_{32} - \varepsilon_{32})}{(\varepsilon_{33} - n_{33})}$$

$$= \frac{(n_{32} - \varepsilon_{32})}{(n_{31} + n_{32} - \varepsilon_{31} - \varepsilon_{32})} \qquad (4)$$

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[2] A referee drew our attention to an unpublished thesis by Medina (1987). This very thorough work contains an analysis of the n-sector specific factors model, and the three-sector version of that model. Our results are entirely concistent with those, as will be pointed out below.

[3] This assumption is valid when a small policy-induced distortion is introduced into an undistorted economy, as for example, when a small tariff is introduced into a regime of free trade. Recall that the dead-weight loss from a tariff in these circumstances is proportional to the *square* of the tariff, which is a second-order effect when the tariff is small.

TABLE 1

Shift Parameter Estimates for Some Developing Countries

Country	Shift Parameter (ω)	Type of Exportable[1]	Period	Study
Mauritius	0.71	NT	1976–82	Greenaway and Milner (1986)
Mauritius	0.86	T	1976–82	Greenaway and Milner (1986)
Cameroon	0.81	NT	1976–87	Milner (1990)
Cameroon	0.73	T	1976–87	Milner (1990)
Ivory Coast	0.55	NT	1960–84	Greenaway (1989)
Ivory Coast	0.69	T	1960–84	Greenaway (1989)
Nigeria	0.83	AX	1960–82	Oyejide (1986)
Nigeria	0.82	T	1960–82	Oyejide (1986)
Madagascar	0.69	NT	1974–84	Milner (1992)
Chile	0.55	T	1959–71	Sjaastad & Clements (1981)
Uruguay	0.57	T	1966–79	Sjaastad (1980b)
Argentina	0.42	T	1935–79	Sjaastad (1980c)
Colombia	0.95	T	1970–8	Garcia (1981)

Notes: [1]All (AX), traditional (T) or non-traditional (NT)

Assuming all goods are substitutes in both production and demand (n_{31}, $n_{32} > 0$; ε_{31}, $\varepsilon_{32} < 0$), the coefficient ω lies between 0 and 1. This is one of the key results which arises from Sjaastad (1980a) and Greenaway and Milner (1988). The term ω is referred to as the 'shift parameter'; it measures the proportion of the burden of import protection that is shifted to the export sector via changes in relative prices. Table 1 provides details of estimated shift parameters from a number of recent studies of the incidence of protection in developing countries. The estimates imply that a large proportion of the burden of import protection may be shifted to the export sector.

Let us now suppose that the protective structure raises the price of importables relative to that of exportables by the proportion t, or

$$\hat{p}_2 - \hat{p}_1 = t \qquad (5)$$

The 'true' rate of protection is then defined as the increase in the price of importables (or exportables) relative to nontradables, i.e. from (3) and (5).

$$\hat{p}_2 - \hat{p}_3 = (1 - \omega)t$$

or

$$\hat{p}_1 - \hat{p}_3 = -\omega t. \qquad (6)$$

Consider first the case of an import tariff equal to t. As long as ω lies between zero and one, the 'true' protection afforded by this import tariff is positive but is less than the tariff rate.[4] An export subsidy could be analyzed by letting t be negative. Again, with ω lying between zero and one, the 'true' subsidy on the export sector is positive but is less than the rate of subsidy. Table 2 illustrates the concept by reporting estimates of true protection from a study of the Ivory Coast. The key point to note is the divergence between nominal and true protection.

III Incidence Theory in Even Models: The Augmented Heckscher-Ohlin and Internationally-Mobile Capital Models

In the augmented Heckscher-Ohlin model the two factors capital and labour are employed in the three sectors. The equality of price and unit cost of production implies the following relationships:

$$\hat{p}_1 = \theta_{1L}\hat{w} + \theta_{1K}\hat{r} \qquad (7)$$

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[4] True protection in fact lies between 0 and t. Where ω takes its limiting values of 0 and unity, the true tariff is equivalent to t and 0 respectively, The intuition here is straightforward. If $\omega = 1$, the price of non-tradables increases in proportion to the tariff and importable production enjoys no relative price advantage relative to non-tradables. By contrast, where $\omega = 0$ the price of non-tradables is unaffected by the tariff and the price of importables therefore increases to $1 + t$ relative to both exportables and non-tradables. These limiting cases are evaluated further in Sjaastad (1980a).

TABLE 2

Estimates of True Tariffs and True Subsidies in the Ivory Coast

	Nominal Tariff on Importables	Nominal Subsdidy on Exportables	Shift Parameter	t^*	s^*
(1) Traditional Exportables	20 per cent	−28 per cent	0.69	14.9 per cent	−33.1 per cent
(2) Non-Traditional Exportables (Annual Data)	20 per cent	2 per cent	0.55	8.1 per cent	−9.9 per cent

Source: Adapted from Greenaway (1989) Table 3

$$\hat{p}_2 = \theta_{2L}\hat{w} + \theta_{2K}\hat{r} \qquad (8)$$

$$\hat{p}_3 = \theta_{3L}\hat{w} + \theta_{3K}\hat{r} \qquad (9)$$

where w and r refer to the prices of labour and capital and the θ's refer to the cost share of the factor in the particular industry; θ_{3L}, for example, is the cost share of labour in the production of nontradables.

Now in equations (7)—(9), any two of the three commodity prices are sufficient to determine factor prices. Once factor prices are determined, the third commodity price is determined. In the context of international trade, it is natural to treat the prices of exportables and import-competing goods as exogenous; thus p_1 and p_2 are exogenous and p_3 is not free to vary independently of p_1 and p_2.

To put the point another way, the supply curve of nontradables is horizontal; given p_1 and p_2, any shift in demand towards or away from nontradables would not change the price of nontradables. Therefore in equation (1) the supply elasticity ε_{33} is infinite. Moreover, we cannot interpret ε_{32} in the normal way, as showing the effect on the supply of good 3 of a change in p_2 holding other prices constant. The reason is that a change in p_2 must alter p_3. Thus the effects of protection cannot be analyzed with the Sjaastad-Clements formulas in this case.

The Heckscher-Ohlin case is not difficult to analyze, however. We may select any of the three goods as numeraire. For convenience we shall select the export good, so $\hat{p}_1 = 0$. This assumption is consistent with the case of a tariff on the import good in the presence of a fixed exchange rate. From (7), (8) and (5), we derive:

$$\hat{w} = \frac{-\theta_{1K}}{(\theta_{2K} - \theta_{1K})}t \qquad (10)$$

$$\hat{r} = \frac{\theta_{1L}}{\theta_{2K} - \theta_{1K}}t \qquad (11)$$

$$\hat{p}_3 = \frac{\theta_{3K} - \theta_{1K}}{\theta_{2K} - \theta_{1K}}t \qquad (12)$$

$$\hat{p}_2 - \hat{p}_3 = \frac{\theta_{2K} - \theta_{3K}}{\theta_{2K} - \theta_{1K}}t \qquad (13)$$

Equations (10) and (11) give the familiar Stolper-Samuelson results that w and r move in opposite directions and that factor prices change in greater proportion than the tariff (the 'magnification' effect).

Equation (12) shows what happens to the price of non-tradables, and equation (13) shows the 'true protection' of import-competing production. The shift parameter from equation (6) is equal to $(\hat{p}_3 - \hat{p}_1)/t$, or since $\hat{p}_1 = 0$, $\omega = \hat{p}_3/t$. From (12), therefore, we have:

$$\omega = \frac{\theta_{3K} - \theta_{1K}}{\theta_{2K} - \theta_{1K}}$$

To fix ideas, let us suppose that import-competing production is more capital intensive than export production, or $\theta_{2K} - \theta_{1K} > 0$. Then from (10) and (11) we see that the wage rate falls and the price of capital rises when the tariff is imposed. Now suppose that non-tradables are more capital intensive than exports but less capital intensive than import-competing production. Then $\theta_{2K} > \theta_{3K} > \theta_{1K}$, and we see from the formula above that $1 > \omega > 0$, which is the Sjaastad-

Clements results. The 'true' rate of protection on import-competing production is less than the nominal protection (see also (13)).

Now suppose, on the other hand, that non-tradables are even more labour intensive than exports, or $\theta_{3K} - \theta_{1K} < 0$. In this case ω is negative and obviously does not lie between zero and one.[5] The tariff causes the price of non-tradables to fall absolutely (see (12)), and the 'true' rate of protection on import-competing production exceeds the nominal protection t (see (13)). Moreover, the imposition of the tariff benefits exports, since p_3 falls relative to p_1; in other words the true protection is positive for both import-competing production and exports.

One could conclude in this case (as Greenaway and Milner, 1988, do), that the non-tradable sector bears more of the burden of the tariff than the export sector. But this is a rather misleading statement since the output of the non-tradable sector actually expands relative to the export sector. The idea that the non-tradable sector is bearing a heavy burden really boils down to the fact that the factors in that sector are on average suffering a loss in real income. But since factors are not identified with sectors in the Heckscher-Ohlin model, there may be nothing to be gained by attempting to locate the burden of the tariff by sector; we might as well describe the burdens in terms of factor prices rather than sectoral prices.

The Heckscher-Ohlin model is an 'even' model in the sense of Ethier (1984): that is, there is an equal number of traded goods and internationally immobile domestic factors. Consequently the domestic factor prices are determined by the goods-prices equations ((7) -(9) above). Any even model will have a horizontal supply curve of non-tradables. Another example worth considering is a model with internationally mobile capital and a specific factor (call it land) in the export sector. In this model equation (7) becomes

[5] Our analysis is in fact consistent with Greenaway and Milner (1988). In their analysis of this case, in which importables are more capital intensive than exports, which are in turn more capital intensive than non-tradables, they are led to use the price of exports as the point of reference against which to compare the other two prices. With that point of reference, they define an alternative shift parameter ω', which lies between 0 and 1 under normal assumptions. The implication of their model, however, is that the tariff can raise the price of exports relative to non-tradables and hence, with the price of non-tradables as the point of reference, the shift parameter ω would be negative.

$$\hat{p}_1 = \theta_{1L}\hat{w} + \theta_{1K}\hat{r} + \theta_{1G}\hat{g} \qquad (7a)$$

where g is the price of land. Given that the international price of capital is exogenous for this small country ($\hat{r} = 0$), and again normalizing on the export price ($\hat{p}_1 = 0$), we have from (5) and (8)

$$\hat{w} = \frac{t}{\theta_{2L}} \qquad (10a)$$

$$\hat{p}_2 - \hat{p}_3 = t\,\frac{\theta_{2L} - \theta_{3L}}{\theta_{2L}} \qquad (13a)$$

yielding a shift parameter defined as

$$\omega = \frac{\theta_{3L}}{\theta_{2L}}$$

Thus the shift parameter is necessarily positive, indicating as expected that some of the burden of the tariff will fall on the export sector, but it will exceed unity if the non-tradable sector is more labour intensive than the import-competing sector, as is likely to be the case. In that event, the true protection of the import-competing sector is negative (see (13a)). We find, then, that in this model with internationally mobile capital a tariff may have the surprising result of protecting the non-tradable sector at the expense of both tradable sectors.[6]

To sum up this section, we have found that the effects of protection in the even models, the augmented Heckscher-Ohlin and the internationally mobile capital models, cannot be carried out with the Sjaastad-Clements apparatus but can easily be derived from the unit cost equations (7)—(9). But this analysis leads one to question the adequacy of these models as vehicles for understanding of the effects of tariff protection. We have pointed out above that in these models the supply elasticity of non-tradables is infinite. This conclusion implies that a transfer (say in the form of foreign

[6] In suggesting extensions, an anonymous referee proposed that we add land without making capital internationally mobile. In this case there are three domestic factors and only two traded goods, so it is an 'odd' model and it will behave basically like our simple specific-factors model developed in the next section, but it is rather messy to develop. Clague (1986) also develops a model with that kind of structure where there are two specific factors, one for sector 1, and one for sector 2, and two mobile factors, labour and capital. The added complexity does not in fact add much insight.

aid) would not change the price of non-tradables relative to tradables. This result runs counter to the empirical judgements of most trade economists. In addition, there is a consensus among trade economists that an import tariff causes the real exchange rate to fall (that is, with a fixed exchange rate the tariff is widely believed to cause the price of non-tradables to rise). But in the case we analyzed above, where $\theta_{3K} < \theta_{1K} < \theta_{2K}$, the tariff produces a rise in the real exchange rate. (This point has been made by Clague, 1986, and Edwards and van Wijnbergen, 1987). We turn therefore to the analysis of incidence in a specific-factors model.

IV Incidence Theory in the Specific-Factors Model

The specific-factors model is one of the most important additions to the corpus of trade theory in the last quarter of a century or so, and has resulted in a number of new insights (for a review, see Falvey, 1993). Let us suppose that in each sector i there is a specific factor K_i with price r_i. Labour is employed in all three sectors. The unit cost equations now become:

$$\hat{p}_1 = \theta_{1L}\hat{w} + \theta_{1K}\hat{r}_1 \qquad (14)$$

$$\hat{p}_2 = \theta_{2L}\hat{w} + \theta_{2K}\hat{r}_2 \qquad (15)$$

$$\hat{p}_3 = \theta_{3L}\hat{w} + \theta_{3K}\hat{r}_3. \qquad (16)$$

Since the specific factors are in fixed supply, the production functions imply the following relationships:

$$\hat{X}_1 = \theta_{1L}\hat{L}_1; \qquad \hat{X}_2 = \theta_{2L}\hat{L}_2; \qquad \hat{X}_3 = \theta_{3L}\hat{L}_3. \qquad (17)$$

The labour demand equations in each sector are functions of the sectoral elasticities of substitution (σ_i) and the relative factor prices,

$$\hat{L}_1 = \sigma_1 (\hat{r}_1 - \hat{w}) \qquad (18)$$

$$\hat{L}_2 = \sigma_2 (\hat{r}_2 - \hat{w}) \qquad (19)$$

$$\hat{L}_3 = \sigma_3 (\hat{r}_3 - \hat{w}) \qquad (20)$$

Full employment of labour implies:

$$\lambda_{L1}\hat{L}_1 + \lambda_{L2}\hat{L}_2 + \lambda_{L3}\hat{L}_3 = 0 \qquad (21)$$

where $\lambda_{Li} = L_i/L$, or the share of sector i in total employment.

The demand for X_3 can be written:

$$\hat{X}_3 = n_{y3}\hat{y} + n_{31}\hat{p}_1 + n_{32}\hat{p}_2 + n_{33}\hat{p}_3 \qquad (22)$$

where $\hat{y}$ is the change in real expenditure. A small change in a tariff, starting from a free trade position, does not change real income and hence $\hat{y}$ may be set equal to zero in the present analysis (see footnote 2 above). Equation (22) then reduces to equation (2) above.

Equations (14)–(22) are 11 equations in 13 variables:

$$\hat{r}_1, \hat{r}_2, \hat{r}_3, \hat{X}_1, \hat{X}_2, \hat{X}_3, \hat{L}_1, \hat{L}_2, \hat{L}_3, \hat{w}, \hat{p}_1, \hat{p}_2, \hat{p}_3.$$

A twelfth equation is:

$$\hat{p}_2 - \hat{p}_1 = t \qquad (5)$$

and we may impose a price normalization condition, which we shall take as $\hat{p}_1 = 0$. Thus the model is determinate and all endogenous variables may be expressed as functions of the parameters and the exogenous variable t.

In order to relate this model to incidence theory, it is sufficient to develop explicit expressions for the supply elasticities (ε_{31} and ε_{32}) (see equation (4)) in terms of the parameters of the specific-factors model. These elasticities may be derived from equations (14) to (21) in the following way. In (14) to (16) we solve for the $\hat{r}$'s in terms of $\hat{w}$ and $\hat{p}$'s. We then substitute for the $\hat{r}$'s in (18) to (20) and express the labour demand equation as:

$$\hat{L}_1 = \frac{\sigma_1}{\theta_{1K}} (\hat{p}_1 - \hat{w})$$

$$\hat{L}_2 = \frac{\sigma_2}{\theta_{2K}} (\hat{p}_2 - \hat{w})$$

$$\hat{L}_3 = \frac{\sigma_1}{\theta_{3K}} (\hat{p}_3 - \hat{w}). \qquad (23)$$

Next we substitute these into the full-employment condition (21) and solve $\hat{w}$. We obtain:

$$\hat{w} = \alpha_1\hat{p}_1 + \alpha_2\hat{p}_2 + \alpha_3\hat{p}_3 \qquad (24)$$

where

$$\alpha_1 = \frac{\lambda_{L1}(\sigma_1/\theta_{1K})}{\sum_{j=1}^{3} \lambda_{Lj} (\sigma_j/\theta_{jK})}$$

and α_2 and α_3 are similarly defined, and we have $\alpha_1+\alpha_2+\alpha_3 = 1$.

The term (σ_1/θ_1) is the absolute value of the elasticity of demand for labour in sector 1, holding the price of output constant. Similar expressions hold for sectors 2 and 3. Thus the α terms are the labour force shares of the three sectors, weighted by their elasticities of labour demand.

From the production function (17) and (23) we

have

$$\hat{X}_3 = -\theta_{3L}\left(\frac{\sigma_3}{\theta_{3K}}\right)(\hat{p}_3 - \hat{w}). \qquad (25)$$

Now, the elasticity ε_{31} is the ratio of $\hat{X}_3$ to $\hat{p}_1$ when $\hat{p}_2$ and $\hat{p}_3$ are held constant and ε_{32} is the ratio of $\hat{X}_3$ to $\hat{p}_2$ when $\hat{p}_1$ and $\hat{p}_3$ are held constant. Thus we set $\hat{p}_3 = 0$ and combine (24) and (25) to obtain:

$$\hat{X}_3 = \theta_{3L}\left(\frac{\sigma_3}{\theta_{3K}}\right)(\alpha_1\hat{p}_1 + \alpha_2\hat{p}_2). \qquad (26)$$

Hence

$$\varepsilon_{31} = \theta_{3L}\left(\frac{\sigma_3}{\theta_{3K}}\right)\alpha_1$$

$$\varepsilon_{32} = \theta_{3L}\left(\frac{\sigma_3}{\theta_{3K}}\right)\alpha_2$$

Substituting for these elasticities in (4) we express the shift coefficient ω as follows.

$$\omega = \frac{n_{32} + \theta_{3L}(\sigma_3/\theta_{3K})\alpha_2}{n_{31} + n_{32} + \theta_{3L}(\sigma_{3L}(\sigma_3/\theta_{3K})(\alpha_1 + \alpha_2))} \quad (27)$$

It can easily be shown that in this model $0 < \omega < 1.$[7]

Recall that ω is the proportion of the burden of an import tariff that falls on the export sector. This burden is clearly greater:

(i) The larger is n_{32} relative to n_{31} and
(ii) The larger is α_2 relative to α_1.

Statement (i) makes intuitive sense because the tariff drives down p_1 relative to p_2 and a factor ameliorating the decline in X_1 (and r_1) is the increased domestic consumption of the export good. The cross elasticities n_{31} and n_{32} are related to the Allen partial elasticities of substitution (s_{31} and s_{32}) in the following way:

$$n_{31} = s_{31}v_1 \text{ and } n_{32} = s_{32}v_2$$

where v_1 and v_2 are the shares of goods 1 and 2 in consumption. Thus if the elasticities of substitution in consumption s_{31} and s_{32} are equal, the ratio of n_{32} to n_{31} equals the ratio of consumption shares v_2/v_1. Hence a factor working against (i.e.

[7] Medina (1987) also analyzes this model. He shows that ω lies between zero and one, and describes the transfers between sectors, using a somewhat different decomposition of effects than ours. He focuses particularly on the extent to which protection of the import-competing sector transfers benefits to the specific factor in the home goods sector.

increasing the burden on) the export sector in many countries is that the export good is little used in the domestic economy. This insight fits well with the empirical finding of high estimated shift coefficients in developing countries which are heavily dependent on exports of primary products and natural-resource-based products (Clements and Sjaastad, 1984; Greenaway, 1989). Note also in this connection that the estimated shift parameter tends to be higher for traditional exports than for non-traditional exports in Table 2 (Cameroon provides the only exception).

To interpret statement (ii) note that:

$$\frac{\alpha_2}{\alpha_1} = \frac{\lambda_{L2}}{\lambda_{L1}}\frac{\sigma_2/\theta_{2K}}{\sigma_1/\theta_{1K}}$$

Thus the burden on the export sector is larger, the greater is the size of the labour force in sector 2 relative to that in sector 1; the greater the production elasticity of substitution in sector 2 relative to sector 1; and the smaller the specific-factor share in sector 2 relative to sector 1. All these relationships are consistent with the expectation that the burden of the tariff falls more heavily on the industry with the more inelastic supply.[8] We can therefore embed incidence analysis in a specific-factors setting. In so doing we gain additional insights into the role of supply side factors, as well as bringing out the role of demand factors. Moreover, it also allows us to link more closely sectoral and factoral incidence. Given the usefulness of the specific-factors perspective, these are analytically helpful insights.

V Concluding Comments

The concepts of incidence and true protection are potentially important tools in evaluating the

[8] To see the role of the term $\theta_{3L}(\sigma_3/\theta_{3K})$, we rewrite (27) as follows:

$$\omega = \frac{\eta_{32}}{\eta_{31} + \eta_{32}}\phi_1 + \frac{\alpha_2}{\alpha_1 + \alpha_1 + \alpha_2}(1 - \phi_1)$$

where $\phi_1 = (n_{31} + n_{32})/[n_{31} + n_{32} + \theta_{3L}(\sigma_3/\theta_{3K})(\alpha_1 + \alpha_2)]$. Thus ω has been expressed as a weighted average of the relative demand elasticities and the relative labour forces weighted by labour demand elasticities, with ϕ_1 as the weight attached to the demand elasticities term. An increase in $\theta_{3L}(\sigma_3/\theta_{3K})$ reduces the weight ϕ_1. Whether this will increase or decrease the shift parameter depends on the relative magnitudes of the two components $n_{32}/(n_{31} + n_{32})$ and $\alpha_1/(\alpha_1 + \alpha_2)$.

impact of protection, especially in a setting where policy makers simultaneously attempt to support both the importable and exportable sectors. This paper has elaborated these concepts in the context of models where the factors of production are explicitly identified. There are several advantages to this approach. First, by working with the augmented Heckscher-Ohlin specification, we clarified some paradoxical results in the prior literature (e.g. Greenaway and Milner, 1988). Second, the explicit treatment of the factors of production reveals that the even models (the augmented Heckscher-Ohlin and the internationally mobile capital models) display some properties that make them questionable vehicles for the analysis of tariffs. For example, these models imply that in some circumstances an import tariff would cause a depreciation rather than an appreciation of the real exchange rate. Finally, the explicit treatment of factors in the specific-factors model is a natural extension of the Sjaastad-Clements framework and provides additional insight into the incidence of tariffs. In the first place the specific-factors model justifies the standard assumption that the shift parameter lies between zero and one. This appears to be the most useful case on which to concentrate attention, since the cases in which the shift parameter lies outside this range are unlikely to arise in practice. In addition, the model spells out the features of the production side of the economy that determine the shift parameter: the elasticities of substitution in production, the factor shares, and the labour force shares of the three sectors. Moreover, the model links the sectoral incidence of protection with the incidence of the factors of production, for it is the specific factor in the burdened sector that loses in real terms, while the specific factor in the favoured sector gains in real terms.

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